DOCUMENT RESUME

ED 253 550 TM 850 087

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TITLE The Influence of Gender, Race, and Socioeconomic Status on Ability Change in Young Adults. Technical Report.
INSTITUTION Ball Foundation, Glen Ellyn, IL.
REPORT NO BF-TR-13
PUB DATE May 84
NOTE 20p.; Portions of this report were presented at the Annual Meeting of the American Psychological Association (92nd, Toronto, Ontario, August 24-28, 1984). For a related study, see TM 850 085.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Ability; *Aptitude Tests; *Individual Development; Longitudinal Studies; Post Secondary Education; *Racial Differences; *Sex Differences; Skill Development; Socioeconomic Status; Vocational Aptitude; Young Adults
IDENTIFIERS *Ball Aptitude Battery; Retesting

ABSTRACT

The Ball Aptitude Battery (BAB) is a multiple ability test battery of specific work skills for use in career counseling. This study reports on ability changes by gender, race, and socioeconomic status in a BAB retest of 112 young adults four years after their initial testing. The sample consisted of 68 females and 44 males; 15 Blacks, 21 Hispanics, and 76 Whites. Test-retest correlations ranged from .32 to .88, with a median of .62. Results showed that: (1) gender and race differentially influenced ability level, but socioeconomic status did not; (2) there was no interaction between these three variables and trial (test vs. retest); and (3) three demographic variables had little effect on the ability change scores over the 4-year period. However, abilities were observed to develop (change positively) into young adulthood. (Author/BS)

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THE INFLUENCE OF GENDER, RACE, AND SOCIOECONOMIC STA
ON ABILITY SCORES IN YOUNG ADULTS

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Technical Report No. 13

THE INFLUENCE OF GENDER, RACE, AND SOCIOECONOMIC STATUS ON ABILITY CHANGE IN YOUNG ADULTS

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Abstract

One hundred and twelve young adults (age 21-22 years; 68 females, 44 males; 15 blacks, 21 hispanics, and 76 whites) retook the Ball Aptitude Battery (consisting of 12 tests) four years after they had initially taken it. Test-retest correlations ranged from .32 to .88, with a median of .62. Results showed that (a) gender and race differentially influenced ability level, but socioeconomic status did not; (b) there was no interaction between these three variables and trial (Time 1 vs. Time 2), and (c) three demographic variables had little effect on the difference scores. However, abilities were observed to develop (change positively) into young adulthood.

The Influence of Gender, Race, and Socioeconomic Status on Ability Change in Young Adults[1]

The Ball Aptitude Battery (BAB) is a multiple ability test battery developed by The Ball Foundation for career counseling (Sung & Dawis, 1981b; Sung, Dawis, & Dohm, 1981). It consists of 12 tests that yield the following 14 ability scores: (a) Clerical, (b) Idea Fluency, (c) Inductive Reasoning, (d) Word Association, (e) Writing Speed, (f) Paper Folding, (g) Vocabulary, (h) Ideaphoria, (i) Finger Dexterity--Left Hand, (j) Finger Dexterity--Right Hand, (k) Grip--Left Hand, (l) Grip--Right Hand, (m) Shape Assembly, and (n) Analytical Reasoning. The first eight scores (Clerical through Ideaphoria) are obtained from paper-and-pencil tests; the last six (Finger Dexterity--Left Hand on) are from apparatus tests.

In the development of the BAB, the battery was standardized on over 1,000 high school students (some juniors, but mostly seniors) from 20 high schools in Illinois and 16 in Texas (see Sung & Dawis, 1981b, for more details). The sexes were about equally represented in this sample; 54% were white, 27% black, and 19% hispanic.

It was found, then, that gender, race, and socioeconomic status contributed differentially in accounting for the variance of BAB ability scores. For example, it was reported by Sung and Dawis (1981a) that the contribution of gender and race (with the

socioeconomic status controlled) was minimal (less than 10% of the variance) for half of the abilities, but significant for the following abilities: Grip (62% and 65% of the variance explained for Left Hand and Right Hand, respectively), Vocabulary (20%), Analytical Reasoning (19%), Shape Assembly (17%), Paper Folding (15%), and Ideaphoria (11%).

It was also reported at that time that BAB ability scores were stable over a six-week interval (test-retest correlations ranged from .64 to .98, with a median of .73). The present study reports on ability change for a sample (N = 112) of the standardization group, observed over a period of four years.

Method

A year and a half after graduation in 1977, the standardization group was followed up by mail with a questionnaire that asked primarily about vocationally relevant activities (further vocational training, employment) after graduation. Almost 600 of the students returned their questionnaires. This subsample was subsequently followed up a second time two years after the first follow-up. This time, the students were requested to retake the BAB in addition to filling out a questionnaire about their vocationally-relevant activities in the interim. Three hundred and seventy students completed the questionnaire while 112 retook the BAB. All 112 completed the paper-and-pencil portion of the battery but, for a variety of reasons, only about half were able

to complete the individually administered apparatus tests. This report is focused on the sample of 112 students, 68 of whom were female, 44 male, 15 black, 21 hispanic, and 76 white.

Results

Table 1 shows the means and standard deviations for test (taken in 1976-77) and retest (taken in 1980-81) for each of the 14 BAB ability scores, and the test-retest correlations. As Table 1 shows, the most stable abilities for this sample were Vocabulary (r = .88), Grip--Right (.85), Grip--Left (.82), and Paper Folding (.82). The least stable abilities were Finger Dexterity--Right (r = .32), Inductive Reasoning (.39), and Analytical Reasoning (.48). Five test-retest correlations were above .75, six were between .50 and .75, and three below .50.

Insert Table 1 about here

Table 1 also shows test-retest correlations obtained on an earlier sample of 261 students who were part of the standardization sample. As these data show, the BAB scores were relatively stable over a six-week interval. For this short an interval, the most stable ability scores were also for Vocabulary, Grip, Clerical, and Paper Folding. The least stable scores were for Word Association and Writing Speed. As expected, the test-retest correlations for the four-year interval were lower than those for the

six-week interval, with Word Association and Paper folding declining the least and Finger Dexterity, Inductive Reasoning, and Analytical Reasoning declining the most.

Difference scores (retest-test) were calculated for each subject on each test, and the results are summarized in Table 2. Statistically significant mean difference scores were found for 10 of the 14 abilities. Mean test-retest differences were not significant for Word Association, Writing Speed, Ideaphoria, and Finger Dexterity--Left. Another way of displaying difference scores is in terms of the proportion of difference scores that were positive (above 0) or negative (below 0). Proportionately more positive scores were found for 10 of the 14 abilities, with Idea Fluency, Ideaphoria, Finger Dexterity--Left, and Finger Dexterity--Right, being the only abilities with proportionately more negative difference scores. Positive scores were significantly more than 50% for seven abilities and negative scores significantly more than 50% for only one ability (Finger Dexterity--Right). In summary, significant growth in ability was detected for Clerical, Inductive Reasoning, Paper Folding, Vocabulary, Grip--Left, Grip--Right, Shape Assembly, and Analytical Reasoning. Signficant decline was observed for Finger Dexterity--Right and possibly Idea Fluency. No significant change was found for the remaining abilities.

Insert Table 2 about here

The influence of gender, race, and socioeconomic status on ability level and difference scores was investigated by analysis of variance and multiple regression. Tables 3 through 6 display the results of these analyses. Table 3 shows that gender influenced the level of scores on Clerical, Writing Speed, and Grip (both Left and Right). Table 4 shows that race influenced the level of scores on a different set of tests: Idea Fluency, Inductive Reasoning, Paper Folding, Vocabulary, Ideaphoria, and Analytical Reasoning. Finally, socioeconomic status did not appear to influence scores on any test, as shown on Table 5. No interaction between trial (Time 1 vs. Time 2) and gender, race, or socioeconomic status was observed. Table 6 summarizes the results of the regression of difference scores for each ability on gender, race, and socioeconomic status. As can be seen from Table 6, generally very little of the difference score variance was explained by these three variables. The exceptions were Vocabulary (R^2 = .01), Word Association (R^2 = .04), Paper Folding (R^2 = .04), and Ideaphoria (R^2 = .03).

Insert Tables 3, 4, 5, and 6 about here

Discussion

It is clear from the preceding results that BAB ability scores changed over a four-year period for this sample of 112 young adults. For the most part the changes were in the direction of growth (overall, 57% of the difference scores were positive), although a sizable proportion of changes (36%) was in the negative direction. The abilities that changed most significantly in a positive direction were: Vocabulary, Grip (both Left and Right Hand), reasoning (both Analytical and Inductive), Clerical, and Paper Folding. This finding indicates that these abilities (most notably, reasoning) continue to develop from late adolescence into young adulthood. It is interesting to note also that most of these abilities had (four-year-interval) test-retest reliabilities in the .80s, indicating that change was generally uniform across the sample, the rank order of individuals being largely maintained over the four-year period. The exceptions to this observation were the reasoning abilities (Analytical and Inductive). Both abilities had relatively low four-year-interval test-retest correlations (.48 and .39, respectively), indicating that change over the four years was differential across the sample. Differential change is more likely to be due to differential experience factors, while uniform change might be more age-related (due to maturational factors) than it is experience-related, except in the unlikely event that experience effects were uniform across the sample.

The present study shows that gender and race have significant effects on the level of certain ability scores (Tables 3 and 4). The influence of gender is most clear on Grip (strength), Clerical (detail perception), and, to some extent, Writing Speed (eye-hand coordination). For race, the effects are greatest on Vocabulary, reasoning (both Inductive and Analytical), Fluency (Idea Fluency and Ideational), and Paper Folding (spatial ability), all, except Paper folding, dealing with the verbal (linguistic) medium. Socioeconomic status did not influence ability level significantly for this sample of young adults.

While gender and race influenced ability level, these factors (and socioeconomic status) had generally little influence on ability-change scores over the four-year period. The most notable effects of the three variables were observed for Vocabulary (R^2 = .01), with socioeconomic status and race contributing 6% and 3% to the variance, respectively. The next strongest effects were observed for Word Association and Paper Folding (R^2 = .04 for each), with race accounting for the explained variance in Word Association, and race and socioeconomic status for Paper Folding. The largest contribution of gender to the variance of ability-change scores was for Finger Dexterity--Right (1% of the explained variance). In summary, there is little support in these data for the expectation that ability development is differential for the sexes and for different racial groups, or that socioeconomic status is a strong factor in ability development, at least not in the

age range 17/18-21/22. There is support for the conclusion that abilities continue to develop into young adulthood, at least for abilities measured by the Ball Aptitude Battery.

References

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Footnote

[1]A portion of this report will be given at the annual American Psychological Association Convention in Toronto, Canada, August 1984.

Table 1

Means, Standard Deviations, and Test-Retest Correlations for a Follow-up Sample of Young Adults (N = 112), by BAB Ability Test

BAB Test	Test			Retest			TRT Correlation	
	N	M	SD	N	M	SD	4-Year	6-week[a]
1. Clerical	112	193.3	20.73	112	199.4	19.82	.76	.89
2. Idea Fluency	112	30.3	10.81	112	28.1	8.11	.59	.73
3. Inductive Reasoning	112	22.6	2.97	112	24.3	2.90	.39	.71
4. Word Association	111	26.6	7.66	112	26.9	8.34	.62	.64
5. Writing Speed	112	154.9	26.26	112	157.4	30.59	.59	.69
6. Paper Folding	112	11.8	5.12	112	13.3	4.72	.82	.85
7. Vocabulary	112	39.9	14.53	112	47.3	15.77	.88	.98
8. Ideaphoria	112	179.7	71.23	111	170.2	66.25	.63	.79
9. Finger Dexterity--Left	111	40.6	5.99	103	5.69	5.69	.51	.79[b]
10. Finger Dexterity--Right	111	4.6	6.01	103	43.5	6.02	.32	--
11. Grip--Left	102	112.6	32.39	48	125.7	35.62	.82	.93[b]
12. Grip--Right	102	123.9	34.26	48	138.3	39.29	.85	--
13. Shape Assembly	106	17.0	7.04	46	21.1	5.99	.61	.70
14. Analytical Reasoning	108	34.8	16.12	47	49.2	17.44	.48	.73

[a]N = 261 (from Sung & Dawis, 1981b). [b]Coefficient calculated for Total Score (Left Score and Right Score).

Table 2

Means, Standard Deviations, Ranges, and Percent of Scores Below and Above Zero for Follow-up Sample, by BAB Test

	BAB Test	N	M	SD	Range	Percent Below 0	Percent Above 0
1.	Clerical	112	6.1**	14.07	-34 to +71	29	69**
2.	Idea Fluency	112	-2.2*	8.94	-38 to +21	58	37
3.	Inductive Reasoning	112	1.7**	3.23	-8 to +9	19	69**
4.	Word Association	112	0.3	7.14	-23 to +24	38	51
5.	Writing Speed	112	2.5	26.06	-83 to +96	43	53
6.	Paper Folding	112	1.5**	2.97	-6 to +9	23	62**
7.	Vocabulary	112	7.4**	7.55	-22 to +25	14	84**
8.	Ideaphoria	111	-9.5	57.85	-122 to +151	55	45
9.	Finger Dexterity--Left	103	-1.1	6.65	-16 to + 33	56	36
10.	Finger Dexterity--Right	103	-3.9*	8.49	-27 to + 45	65**	30
11.	Grip--Left	48	15.4**	37.62	-40 to +172	13	72**
12.	Grip--Right	48	17.8**	43.93	-39 to +224	34	66**
13.	Shape Assembly	46	2.7*	7.28	-14 to +28	30	57
14.	Analytical Reasoning	47	13.3**	19.33	-7 to +63	23	70**

*Significantly different from 0.0 or 50% at $p \leq .05$. **Significantly different from 0.0 or 50% at $p \leq .01$.

Table 3

Means and F-Ratios in the Analysis of Variance of Ability Test Scores with Gender and Time as Independent Variables, by BAB Test

BAB Test	Means				F-Ratios		
	Female	Male	Time 1	Time 2	Gender	Trial	Interaction
1. Clerical	202.3	186.4	192.0	196.7	20.255**	1 8.265**	2.319
2. Idea Fluency	29.5	28.8	30.2	28.0	0.189	6.004*	0.129
3. Inductive Reasoning	23.7	23.5	22.6	24.5	0.174	28.279**	0.000
4. Word Association	26.3	27.9	27.1	27.1	1.159	0.000	0.263
5. Writing Speed	159.7	150.3	153.6	156.4	3.936*	1.174	0.429
6. Paper Folding	12.1	13.2	11.9	13.4	1.373	21.572**	0.233
7. Vocabulary	45.3	40.8	39.2	46.8	2.623	101.834**	0.205
8. Ideaphoria	184.6	170.0	185.9	168.7	1.507	5.923**	0.213
9. Finger Dexterity--Left	40.6	40.4	41.5	39.5	0.035	6.292**	0.243
10. Finger Dexterity--Right	45.2	44.5	46.2	43.5	0.352	12.226**	0.054
11. Grip--Left	100.6	145.9	120.3	126.4	46.843**	3.559	0.003
12. Grip--Right	107.4	160.1	130.0	137.5	58.946**	5.834*	0.005
13. Shape Assembly	18.4	21.1	18.6	20.9	2.782	5.772*	0.217
14. Analytical Reasoning	44.8	41.3	36.5	49.6	0.586	23.380**	0.010

*Significantly different from 0.0 or 50% at $p \leq .05$. **Significantly different from 0.0 or 50% at $p \leq .01$.

Table 4

Means and F-Ratios in the Analysis of Variance of Ability Test Scores with Race and Time as Independent Variables, by BAB Test

BAB Test	Means					F-Ratios		
	Black	Hispanic	White	Time 1	Time 2	Race	Trial	Inter-Action
1. Clerical	192.1	190.8	197.8	191.2	195.9	0.869	5.324*	0.078
2. Idea Fluency	24.3	26.6	30.9	28.2	26.3	3.974**	3.049	0.071
3. Inductive Reasoning	21.9	23.5	23.9	22.4	23.8	5.013**	9.364**	2.369
4. Word Association	28.0	28.7	26.3	27.6	27.8	0.621	0.061	1.058
5. Writing Speed	148.1	152.6	158.3	152.7	153.3	0.981	0.037	0.618
6. Paper Folding	9.8	12.1	13.3	10.9	12.5	3.549*	20.318**	0.786
7. Vocabulary	35.6	35.6	47.1	36.1	42.7	5.419**	33.975**	1.345
8. Ideaphoria	139.5	179.6	186.6	172.7	164.5	4.287*	0.875	1.702
9. Finger Dexterity--Left	38.2	40.2	41.1	40.5	39.2	1.556	1.472	0.659
10. Finger Dexterity--Right	43.9	44.3	45.2	45.6	43.3	0.369	5.185*	0.215
11. Grip--Left	107.6	129.3	125.6	117.9	123.7	1.383	2.119	0.037
12. Grip--Right	43.9	44.3	45.2	45.6	43.3	0.369	5.185*	0.215
13. Shape Assembly	16.0	20.1	20.8	17.7	20.2	2.425	4.947*	0.716
14. Analytical Reasoning	28.3	41.8	46.9	32.0	46.0	5.043*	17.574**	0.962

*Significantly different from 0.0 or 50% at $p \leq .05$. **Significantly different from 0.0 or 50% at $p \leq .01$.

Table 5

Means and F-Ratios in the Analysis of Variance of Ability Test Scores with Socioeconomic Status and Time as Independent Variables, by BAB Test

BAB Test	Means					F-Ratios		
	Low	Middle	High	Time 1	Time 2	SES	Trial	Inter-Action
1. Clerical	200.4	192.2	196.8	193.7	199.2	1.278	8.928**	0.461
2. Idea Fluency	26.4	30.2	29.3	29.8	27.4	1.610	6.333*	0.484
3. Inductive Reasoning	22.9	23.8	23.6	22.5	24.5	0.933	26.370**	0.472
4. Word Association	26.4	27.4	26.8	27.0	26.8	0.118	0.059	0.405
5. Writing Speed	152.6	156.9	156.1	153.5	156.9	0.242	1.376	0.029
6. Paper Folding	10.7	12.3	13.3	11.4	12.8	2.335*	17.071**	0.579
7. Vocabulary	41.2	41.4	45.5	39.1	46.3	0.819	56.348**	1.608
8. Ideaphoria	169.6	179.9	180.3	185.0	168.2	0.281	4.468*	0.071
9. Finger Dexterity--Left	40.3	41.1	40.3	41.5	39.6	0.184	4.398*	0.050
10. Finger Dexterity--Right	45.2	44.8	44.8	46.4	43.5	0.047	10.293**	0.123
11. Grip--Left	119.3	118.1	126.8	117.9	124.8	0.252	3.651	0.897
12. Grip--Right	126.9	127.8	138.5	127.7	134.5	0.382	3.705	0.158
13. Shape Assembly	16.8	19.7	20.8	18.0	20.2	1.601	3.995*	0.471
14. Analytical Reasoning	40.1	36.5	46.0	34.7	47.0	1.108*	14.226**	2.644

*Significantly different from 0.0 or 50% at $p \leq .05$. **Significantly different from 0.0 or 50% at $p \leq .01$.

Table 6

Betas, Simple rs, R^2 and R in the Multiple Regression of Ability Test Scores on Gender, Race, and Socioeconomic Status, by BAB Test

BAB Test	Gender		Race		SES			
	B	r	B	r	B	r	R^2	R
1. Clerical	-.08	-.09	.05	.05	.03	.05	.012	.108
2. Idea Fluency	.02	.02	-.06	-.06	--	--	.004	.061
3. Inductive Reasoning	-.02	-.02	.14	.13	-.09	-.06	.023	.153
4. Word Association	--	--	-.21	-.21	--	--	.043	.207
5. Writing Speed	-.06	-.06	.14	.12	-.08	-.05	.025	.158
6. Paper Folding	-.03	-.03	-.18	-.15	.14	.10	.043	.208
7. Vocabulary	-.01	-.03	-.16	.21	.23	.27	.097	.312
8. Ideaphoria	.02	.03	-.11	-.14	-.11	-.14	.032	.179
9. Finger Dexterity--Left	.08	.08	-.10	-.11	-.03	-.06	.091	.137
10. Finger Dexterity--Right	.11	.11	-.08	-.08	-.02	-.01	.018	.134
11. Grip--Left	--	--	-.10	-.08	.05	.03	.010	.098
12. Grip--Right	.01	.01	-.08	-.07	.05	.03	.007	.086
13. Shape Assembly	.07	.07	-.07	-.05	.07	.05	.011	.106
14. Analytical Reasoning	.06	.06	.10	.10	.02	.00	.013	.115